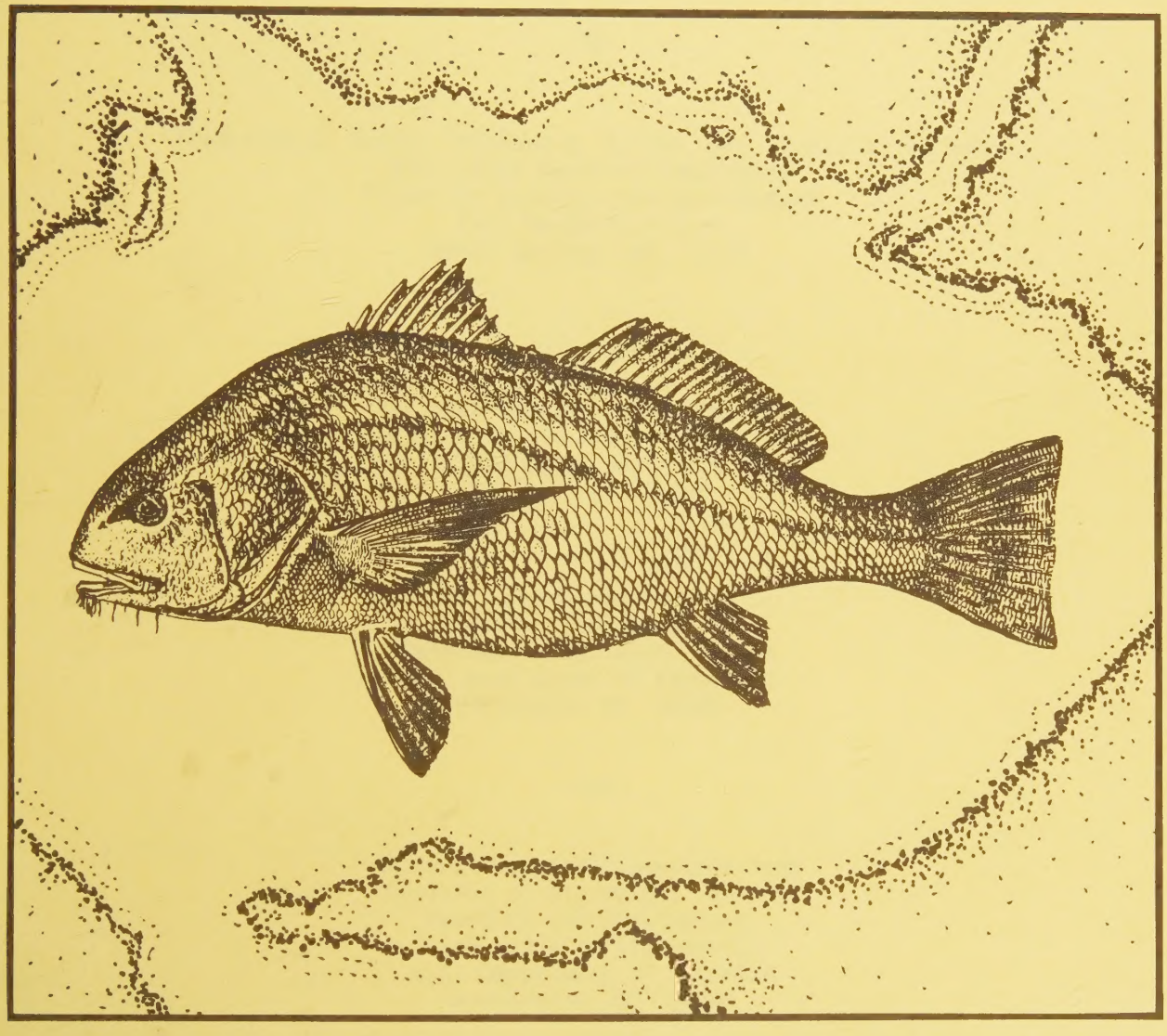
Biological Report 82 (11.51)
April 1986

TR EL-82-4

Species Profiles: Life Histories and Environmental Requirements of Coastal Fishes and Invertebrates (Gulf of Mexico)

BLACK DRUM



Fish and Wildlife Service
U.S. Department of the Interior

Coastal Ecology Group
Waterways Experiment Station
U.S. Army Corps of Engineers

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Species Profiles: Life Histories and Environmental Requirements of Coastal Fishes and Invertebrates (Gulf of Mexico)

BLACK DRUM

by

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U.S. Army Corps of Engineers
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Research and Development
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PREFACE

This species profile is one of a series on coastal aquatic organisms, principally fish, of sport, commercial, or ecological importance. The profiles are designed to provide coastal managers, engineers, and biologists with a brief sketch of the biological characteristics and environmental requirements of the species and to describe how the species may be expected to react to environmental changes caused by coastal development. Each profile has sections on taxonomy, life history, ecological role, environmental requirements, and economic importance, if applicable. A three-ring binder is used for this series so that new profiles can be added as they are prepared. This project is jointly planned and financed by the U.S. Army Corps of Engineers and the U.S. Fish and Wildlife Service.

Suggestions or questions regarding this report should be directed to:

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Vicksburg, MS 39180

CONVERSION TABLE

Metric to U.S. Customary

Multiply	By	To Obtain
millimeters (mm)	0.03937	inches
centimeters (cm)	0.3937	inches
meters (m)	3.281	feet
kilometers (km)	0.6214	miles
square meters (m^2)	10.76	square feet
square kilometers (km^2)	0.3861	square miles
hectares (ha)	2.471	acres
liters (l)	0.2642	gallons
cubic meters (m^3)	35.31	cubic feet
cubic meters	0.0008110	acre-feet
milligrams (mg)	0.00003527	ounces
grams (g)	0.03527	ounces
kilograms (kg)	2.205	pounds
metric tons (t)	2205.0	pounds
metric tons	1.102	short tons
kilocalories (kcal)	3.968	British thermal units
Celsius degrees	1.8(°C) + 32	Fahrenheit degrees

U.S. Customary to Metric

inches	25.40	millimeters
inches	2.54	centimeters
feet (ft)	0.3048	meters
fathoms	1.829	meters
miles (mi)	1.609	kilometers
nautical miles (nmi)	1.852	kilometers
square feet (ft^2)	0.0929	square meters
acres	0.4047	hectares
square miles (mi^2)	2.590	square kilometers
gallons (gal)	3.785	liters
cubic feet (ft^3)	0.02831	cubic meters
acre-feet	1233.0	cubic meters
ounces (oz)	28.35	grams
pounds (lb)	0.4536	kilograms
short tons (ton)	0.9072	metric tons
British thermal units (Btu)	0.2520	kilocalories
Fahrenheit degrees	0.5556(°F - 32)	Celsius degrees

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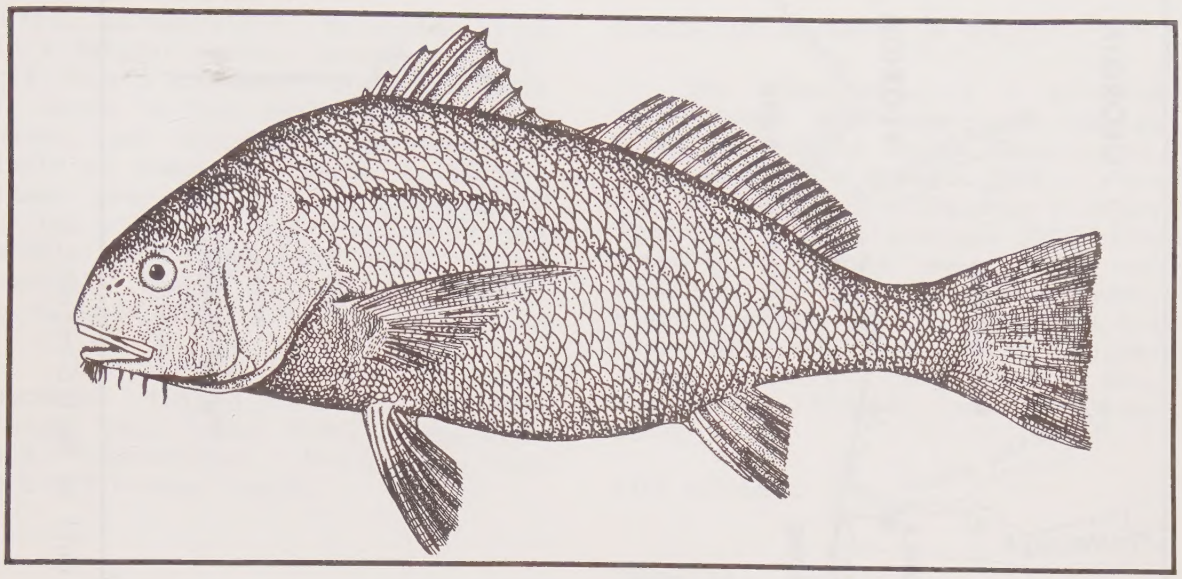

Figure 1. Adult black drum, Pogonias cromis (Linnaeus) (Goode 1884).

BLACK DRUM

NOMENCLATURE/TAXONOMY/RANGE

Scientific name . . . Pogonias cromis (Linnaeus)
Preferred common name . . . Black drum (Figure 1)
Other common names . . . . Sea drum, gray drum, oyster cracker, drum fish, banded drum, striped drum, puppy drum, and butterfly drum (Silverman 1979).
Class . . . . . Osteichthyes
Order . . . . . Perciformes
Family . . . . . Sciaenidae

Geographic range: Black drum inhabit nearshore waters and estuaries from Argentina northward along the gulf and Atlantic coasts to southern New England (Bigelow and Schroeder 1953), and as far north as the Bay of Fundy (Bleakney 1963). They are common from Chesapeake Bay south to Florida and most abundant along the Texas coast (Simmons and Breuer 1962; Figure 2).

MORPHOLOGY/IDENTIFICATION AIDS

The following morphological description was taken from the summary provided by Johnson (1978):

Dorsal fin X-I, 19-23; anal fin II, 5-7; caudal fin, 9+8, procurrent rays

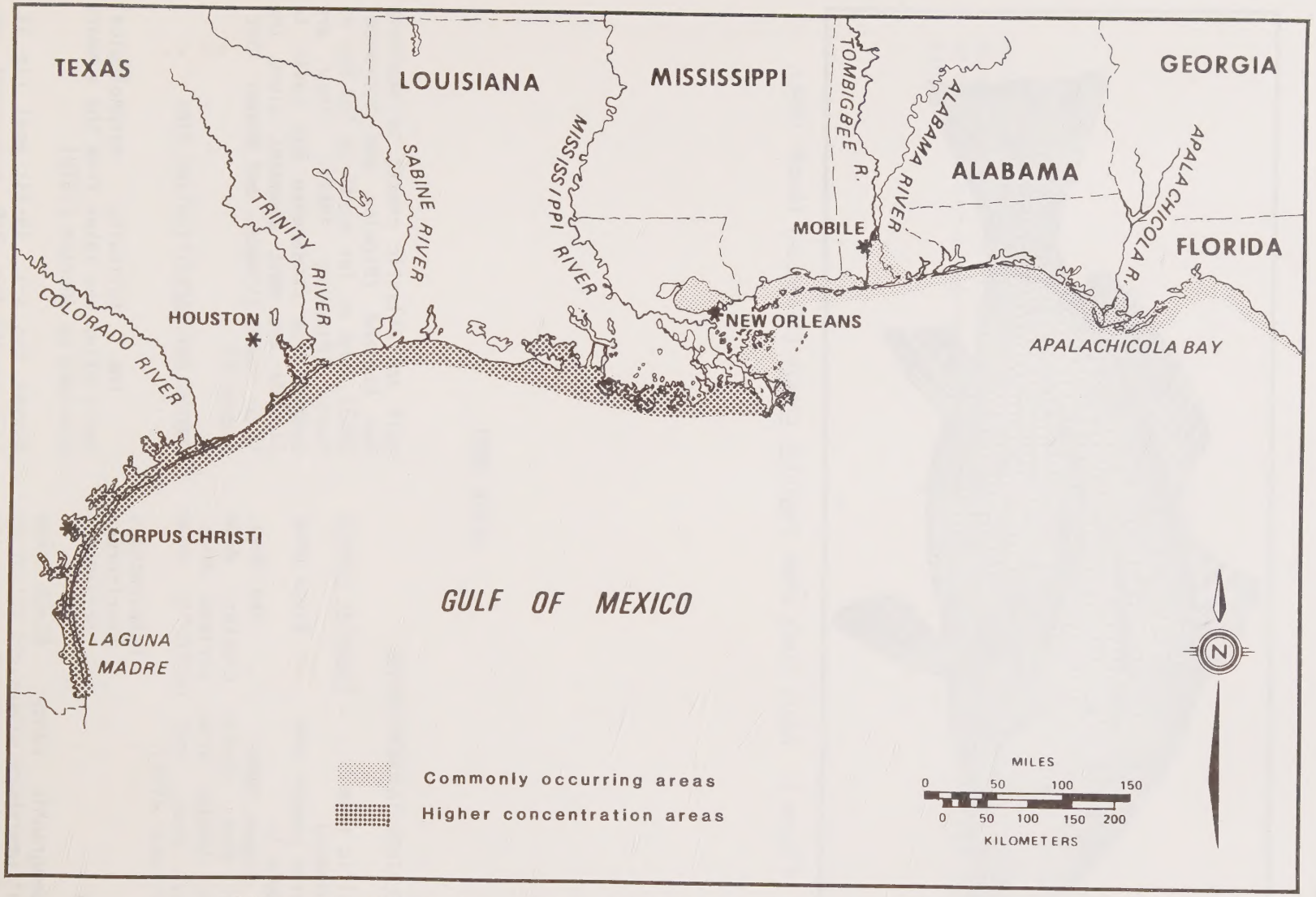

Figure 2. Distribution of the black drum in the Gulf of Mexico region.

8-9+8; pelvic fin I, 5; scales 41-45 in a lateral series; vertebrae 10+14; gill rakers 4-6+12-16; branchiostegals 7; teeth in jaws small, set in broad bands, not especially enlarged; no teeth on vomer, palatines, or tongue; lower pharyngeals large, completely united with many blunt molars at the middle and surrounded with strong conical teeth (unpublished data, L. N. Chao, LNC).

Head 2.9-3.4, body depth 2.3-2.8, pectoral fin 3.3-3.6 in standard length (SL); snout 2.8-3.7, eye 2.8-3.9, interorbital 3.0-4.0, maxillary 2.5-3.3 in head length.

Body oblong, moderately compressed, back much elevated; ventral outline nearly straight; head moderately short, snout blunt; mouth horizontal, inferior, lower jaw included; maxillary scarcely reaching below middle of eye; chin with five pores and 12 to 13 pairs of barbels along inner edges of lower jaw (LNC), the series usually extending back to below middle of eye. Scales firm, ctenoid. Dorsal fin continuous, with a deep notch between the spinous and soft portions (LNC); dorsal spines stiff and slender, the third longest; anal fin short, the second spine much enlarged; caudal fin subtruncate; pectoral fins about as long as head (Figure 1).

Live adults are silvery or blackish with a brassy luster (Silverman 1979), and the fins have a black or dusky color. Coloration may change with habitat and age (Simmons and Breuer 1962). Young black drum usually have 4 to 6 vertical black bars on their sides. In the Gulf of Mexico, black drum are almost uniformly silvery, losing vertical crossbars early in life. Fish occupying bays and lagoons are darker in color, often bronze along the back and dirty white on the side and belly (Simmons and Breuer 1962; Johnson 1978).

REASON FOR INCLUSION IN SERIES

The black drum is a valuable recreational and commercial species along the Gulf of Mexico (Ross et al. 1983; Osburn and Matlock 1984). Commercial landing of black drum in Texas from 1977 to 1982 averaged 593,200 kg annually, with a mean value of $550,900 per year (Hamilton 1983). Black drum have been identified as the most important fish in the winter sport fishery in Biloxi Bay, Mississippi (Etzold and Christmas 1979).

LIFE HISTORY

Spawning

Black drum mature by the end of their second year of life at standard lengths (SL) of 285-330 mm (Simmons and Breuer 1962; Silverman 1979). They spawn in or near passes into the Gulf of Mexico and in open bays and estuaries (Pearson 1929; Simmons and Breuer 1962; Hoese 1965; Etzold and Christmas 1979). In Texas, ripe black drum were observed by Ross et al. (1983) in water as deep as 27 m. Cody et al. (1985) collected gravid and spent fish most frequently in water 20-27 m deep. Actual spawning in the gulf has not been directly observed; however, ripe and spent fish have been taken in the same location and during the same period as black drum larvae.

Spawning time depends somewhat on geographic location. In Texas waters, about 90% of the spawning occurs in February and March (Simmons and Breuer 1962), but some spawning activity occurs as late as June or July. Cornelius (1984) found that the gonad-somatic index (GSI, used as an indication of reproductive readiness) of black drum from Alazan Bay, Texas, increased in late winter and early spring, and included a secondary rise during the fall. In deeper gulf waters off Texas, Cody et al. (1985)

reported that spawning occurs during November through April.

Eggs and Fecundity

The eggs of black drum are 0.8 to 1 mm in diameter and pelagic; they contain two to six oil globules in the early stages (average is two or three), which coalesce into a single globule prior to hatching (Joseph et al. 1964). Black drum eggs are reported to hatch in less than 24 hours at 20 °C (Joseph et al. 1964). Little is known about the fecundity of black drum, but Pearson (1929) estimated that a ripe female 1.1 m in total length (TL) contained about 6,000,000 eggs.

Larvae

Black drum larvae are 1.9-2.4 mm in total length (TL) at hatching (Joseph et al. 1964). When the larvae are about 2.8 mm long, the yolk sac is almost completely absorbed. The general adult shape is achieved when they reach a length of 15 mm TL (Pearson 1929). A detailed description of the morphology of larval black drum has been reported by Pearson (1929) for Texas, by Lippson and Moran (1974) for Delaware Bay, and by Joseph et al. (1964) for Chesapeake Bay. After hatching, the larvae are transported by tidal currents into estuaries. In Texas, larval and postlarval black drum were first caught in February and March, and were most frequently taken in or near the main channel of Corpus Christi Pass (Pearson 1929). Collection of larval black drum continued through March and April. Postlarval black drum are also taken in March or April in Alabama waters, near Dauphin Island (Steven Heath, Department of Conservation and Natural Resources, Dauphin Island, Alabama; pers. comm.).

Juveniles

Juvenile black drum prefer shallow, nutrient rich and relatively muddy waters (e.g., tidal creeks and channels) along the Gulf of Mexico (Pearson 1929). While juveniles utilize the estuarine environment, they can tolerate a wide range of salinities and water temperatures (Simmons and Breuer 1962). Young black drum have even been taken in freshwater (Gunter 1942, 1956; Frisbie 1961; Thomas and Smith 1973). Most black drum stay in the shallow bay areas until they reach sexual maturity.

Adults

Adult black drum are predominantly an estuarine species (Hoese and Moore 1977), and are common in shallow estuaries throughout the Gulf of Mexico (Silverman 1979). Black drum tagged near Baffin Bay (Laguna Madre), Texas, showed little intra-bay movement, and 60% were captured less than 5 mi from where they were marked (Simmons and Breuer 1962). Beaumariage (1969) also reported little movement by Florida fish.

Osburn and Matlock (1984) more recently examined the movement patterns of black drum along the Texas coast. They found limited movement of young fish (3 years and younger) from several bay systems to the gulf. Larger (older) fish were taken in gulf waters off Texas at depths of 5-27 m from December to June (Ross et al. 1983). Cody et al. (1985) also caught adult black drum in the deeper gulf waters off Texas at depths of up to 37 m, but the majority of fish were caught in the 20-27 m zone. Osburn and Matlock (1984) hypothesized that a quasi-permanent movement of black drum from the bay to the gulf takes place at age 4 or older, making the bay systems the primary area of recruitment to the spawning stocks of older black drum.

GROWTH CHARACTERISTICS

Information on growth of black drum in the Gulf of Mexico is rela-

tively scarce. Pearson (1929) used length-frequency analysis to determine that drum in Texas waters were about 250 mm long (TL) at the end of the first year of life, and about 370 mm long by the end of their second year. He also reported that the large size and heavy calcification of drum scales made age determination difficult and unreliable after the fourth or fifth year of life, when drum were about 600 mm long. Simmons and Breuer (1962) used length-frequency analysis and tag return data to conclude that black drum in Texas waters attained a standard length of 160 mm at the end of their first year, 310 mm at the end of the second, and 415 mm by the end of the third year of life. Older drum grew about 50 mm SL/year. On the basis of 14 fish taken from gulf waters off Texas, Marcello and Strawn (1972) calculated the following length-weight relation:

log W = -4.98107+3.16465 log L (W = weight in grams and L = standard length in millimeters).

THE FISHERY

Black drum are harvested with a variety of gear. In the Gulf of Mexico, they are captured in gill nets, drag-seines, trawls, and other types of nets, and on trotlines (Silverman 1979). In Alabama, most drum in the commercial fishery are caught incidentally with other species.

Most of the U.S. commercial harvest of black drum occurs in the Gulf of Mexico. From 1950 to 1976, 84% of total U.S. landings of black drum were taken in the gulf; Texas alone contributed 56% of the total catch (Silverman 1979). The black drum has only moderate commercial value because of the relatively poor quality of its flesh, particularly in the large fish. Therefore, small black drum (less than 20 inches) are valued more highly as food (Silverman 1979).

A cestode known as the "spaghetti worm" is frequently found in the flesh of larger drum making it unattractive for human consumption, though it presents no health hazard (Simmons and Breuer 1962; Etzold and Christmas 1979; Silverman 1979).

The sport catch for black drum in the Gulf of Mexico is much greater than commercial landings (Silverman 1979). On the basis of angling surveys, fishermen in the gulf from the Florida Keys west to Texas caught 4,580,000 fish in 1960 (Clark 1962), 1,923,000 fish in 1965 (Deuel and Clark 1968) and 9,489,000 fish in 1970 (Deuel 1973). Marine recreational fishery statistics for black drum in the gulf for 1979, 1981, and 1982 are summarized in Table 1.

ECOLOGICAL ROLE

Food Habits

Black drum larvae feed largely on zooplankton (Benson 1982). Food of the young consists chiefly of marine annelids, soft crustaceans, and small fishes (Simmons and Breuer 1962). According to Pearson (1929), young black drum (8-20 cm TL) tended to eat small fish (36%) and polychaetes (32%). Thomas (1971) reported that the young fed mainly on small invertebrates such as copepods, annelids (including polychaetes), and amphipods.

In Texas estuaries, the dominant food of black drum longer than 20 cm was the mollusk Mulinia transversa corbuloides, an inhabitant of muddy bottoms. This mollusk made up about 33% of the diet of black drum 21-50 cm long; larger drum ate mostly mollusks (74%) and crabs (16%). Simmons and Breuer (1962) reported that larger fish fed on mollusks and shrimp, whereas Miles (1949) reported that black drum in Aransas Bay, Texas, fed heavily on shrimp, mollusks, and aquatic vegetation. Cave and Cake (1980) reported that moderate to large

Table 1. Summary of recreational fishing statistics for black drum in the Gulf of Mexico.

Time	Total U.S. catch (thousands of fish)	U.S. catch from Gulf of Mexico (thousands of fish)	Percent of gulf catch by gulf State					Estimated gulf catch by fishing mode (thousands of fish)				
			FL	AL	MS	LA	TX	Piers/ jetties	Beach/ bank	Party/ charter	Private/ rental	Total
Jan-Dec 1979[a]	2,665	2,245 (84.2%)	3.3	--	--	39.8	56.3	235	32	--	1,978	2,245
Mar-Dec 1981[b]	1,713	1,638 (95.6%)	5.6	--	3.0	14.6	76.3	417	595	--	625	1,638
Jan-Dec 1982[b]	1,704	1,505 (88.3%)	11.4	--	--	60.8	26.6	344	289	--	871	1,505

[a]U.S. National Marine Fisheries Service (1980).
[b]U.S. National Marine Fisheries Service (1985).

captive drum were capable of consuming more than two oysters of commercial size per kilogram of body weight each day. Black drum are known to destroy large numbers of oysters on seed reefs and oyster lease areas in Louisiana and Mississippi (Benson 1982).

Feeding Behavior

Black drum are primarily bottom feeders, although they sometimes feed near the surface on small menhaden (Ackerman 1951). In shallow water, black drum sometimes feed on the bottom in a vertical position so that their tails stick out of the water (Pearson 1929). They are well-adapted for bottom feeding; their mouth and sensitive chin barbels aid in searching for food, and their strong pharyngeal teeth crush the shells of mollusks and crabs (Simmons and Breuer 1962).

Competitors

Interactions between black drum and other species have not been extensively studied. Because of its strong pharyngeal teeth, this species probably has few competitors for mollusks (e.g., oysters); however, they may compete with the red drum and other bottom feeders for other benthic resources.

ENVIRONMENTAL REQUIREMENTS

Salinity and Temperature

In coastal waters and estuaries of the Gulf of Mexico, black drum are common in salinities ranging from 9 to 26 ppt, and in water temperatures of 12 to 33 °C (McIlwain 1978). They can tolerate salinity extremes of 0 ppt (Gunter 1956) and rarely 80 ppt (Simmons and Breuer 1962).

Sudden drops in temperature have caused black drum to move from the shallow waters of the upper Laguna Madre, Texas, to the deeper waters of nearby Baffin Bay and Corpus Christi Bay. Mass mortality is relatively common when water temperatures drop sharply and are sustained for extended periods (Simmons and Breuer 1962).

Substrate Features

Juvenile black drum are most common over muddy bottoms in estuarine systems (Pearson 1929). Adults are most common over sand or soft bottoms and over oyster reefs and clam shell deposits.

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15. Supplementary Notes

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16. Abstract (Limit: 200 words)

Species profiles are literature summaries of the taxonomy, morphology, range, life history and environmental requirements of coastal aquatic species. They are designed to assist environmental impact assessment. Black drum are primarily an estuarine species. The time of black drum spawning depends on location. In Texas waters, heaviest spawning activity occurs during February and March near passes in open bays and estuaries, while in deeper Gulf waters they spawn from November to April. Larvae are transported into the estuarine environment where they grow to the juvenile stage, living in shallow, muddy waters, tolerating a wide range of environmental conditions. Black drum are commercially harvested by a variety of gears, with the majority of U.S. landings taken in Gulf waters off Texas. They are also an important recreational species with more fish caught in the sport catch than harvested commercially. Young black drum feed on invertebrates and small fish, while adults consume mollusks and some decapods. Adults are found in salinities of 9 to 26 ppt and in water temperatures of 12 to 33°C. Juveniles are taken over muddy bottoms and adults are usually found over sand or soft bottoms and over oyster reefs or clam shell.

17. Document Analysis a. Descriptors

Estuaries
Life cycles
Growth
Feeding habits
Fisheries
Fishes

b. Identifiers/Open-Ended Terms

Black Drum
Pogonias cromis
Spawning
Habitat requirements

c. COSATI Field/Group

18. Availability Statement	19. Security Class (This Report)	21. No. of Pages
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Department of Commerce

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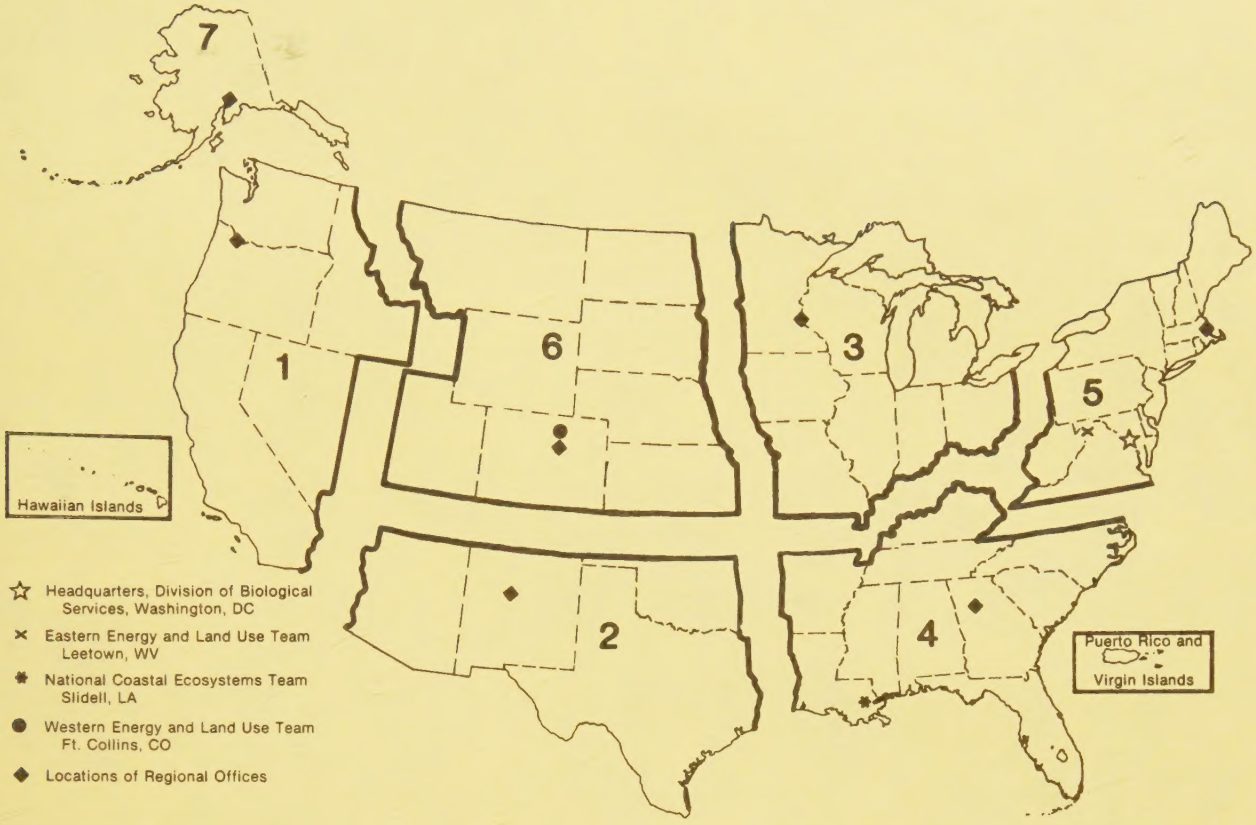

REGION 1
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U.S. Fish and Wildlife Service
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Portland, Oregon 97232

REGION 2
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Denver, Colorado 80225

REGION 7
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DEPARTMENT OF THE INTERIOR
U.S. FISH AND WILDLIFE SERVICE

As the Nation's principal conservation agency, the Department of the Interior has responsibility for most of our nationally owned public lands and natural resources. This includes fostering the wisest use of our land and water resources, protecting our fish and wildlife, preserving the environmental and cultural values of our national parks and historical places, and providing for the enjoyment of life through outdoor recreation. The Department assesses our energy and mineral resources and works to assure that their development is in the best interests of all our people. The Department also has a major responsibility for American Indian reservation communities and for people who live in island territories under U.S. administration.